AWARD/CONTRACT	1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)	RATING	PAGE OF PAGES 1 | 2

2. CONTRACT (Proc. Inst. Ident.) NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUEST/PROJECT NO.
EP-C-17-031/68HERC22F0012	See Block 20C	PR-ORD-21-01680

5. ISSUED BY	CODE	6. ADMINISTERED BY (If other than Item 5)	CODE
CAD	CAD		

CAD
US Environmental Protection Agency
26 West Martin Luther King Drive
Mail Code: W136
Cincinnati OH 45268-0001

7. NAME AND ADDRESS OF CONTRACTOR (No., street, country, State and ZIP Code)	8. DELIVERY	9. DISCOUNT FOR PROMPT PAYMENT	10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN	ITEM
TETRA TECH, INC. Attn: George Townsend 10306 EATON PL STE 340 FAIRFAX VA 22030	☐ FOB ORIGIN ☒ OTHER (See below)			

CODE	198549560	FACILITY CODE	

11. SHIP TO/MARK FOR	CODE	ORD RTP	12. PAYMENT WILL BE MADE BY	CODE	RTP FMC

Office of Research and Development
US Environmental Protection Agency
109 T.W. Alexander Drive
Research Triangle Park NC 27711

RTP Finance Center
US Environmental Protection Agency
RTP-Finance Center (AA216-01)
109 TW Alexander Drive
www2.epa.gov/financial/contracts
Durham NC 27711

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:	14. ACCOUNTING AND APPROPRIATION DATA
☐ 10 U.S.C. 2304 (c) ( ) ☒ 41 U.S.C. 3304 (a) ( )	See Schedule

15A. ITEM NO	15B. SUPPLIES/SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	Continued				
	15G. TOTAL AMOUNT OF CONTRACT				$220,119.72

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
		PART I - THE SCHEDULE				PART II - CONTRACT CLAUSES	
	A	SOLICITATION/CONTRACT FORM			I	CONTRACT CLAUSES	
	B	SUPPLIES OR SERVICES AND PRICES/COSTS				PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.	
	C	DESCRIPTION/SPECS./WORK STATEMENT			J	LIST OF ATTACHMENTS	
	D	PACKAGING AND MARKING				PART IV - REPRESENTATIONS AND INSTRUCTIONS	
	E	INSPECTION AND ACCEPTANCE			K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
	F	DELIVERIES OR PERFORMANCE					
	G	CONTRACT ADMINISTRATION DATA			L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	H	SPECIAL CONTRACT REQUIREMENTS			M	EVALUATION FACTORS FOR AWARD	

CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE

17. ☒ CONTRACTOR' S NEGOTIATED AGREEMENT (*Contractor is required to sign this document and return* _____ *copies to issuing office.)* Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. *(Attachments are listed herein.)*

18. ☐ SEALED-BID AWARD (*Contractor is not required to sign this document.*) Your bid on Solicitation Number 68HERC21R0202, including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed-bid contract.)

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER
	Mark Cranley

19B. NAME OF CONTRACTOR	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA	20C. DATE SIGNED
TETRA TECH, INC. BY *(Signature of person authorized to sign)*		BY [signature] ELECTRONIC SIGNATURE *(Signature of the Contracting Officer)*	10/26/2021

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STANDARD FORM 26 (Rev. 3/2013)
Prescribed by GSA - FAR (48 CFR) 53.214(a)

NAME OF OFFEROR OR CONTRACTOR

TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	DUNS Number: 198549560 TOCOR: Caroline Ridley Delivery: 10/21/2022 Period of Performance: 10/22/2021 to 10/21/2022				
0001	New FFP Task Order under the Tetra Tech Inc. Contract #EP-C-17-031 for CPHEA entitled "Development of technical resources for managing aquatic ecosystem stressors," in accordance with the attached PWS. Product/Service Code: R499 Accounting Info: 21-22-C-26D2000-000FK7XR4-2532-26A5C-2126D2C022-001 BFY: 21 EFY: 22 Fund: C Budget Org: 26D2000 Program (PRC): 000FK7XR4 Budget (BOC): 2532 Cost: 26A5C DCN - Line ID: 2126D2C022-001 Funding Flag: Complete Funded: $97,000.00 Accounting Info: 21-22-C-26D2000-000F84-2532-26A5C-2126D2C022-002 BFY: 21 EFY: 22 Fund: C Budget Org: 26D2000 Program (PRC): 000F84 Budget (BOC): 2532 Cost: 26A5C DCN - Line ID: 2126D2C022-002 Funding Flag: Complete Funded: $52,119.72 Accounting Info: 21-22-C-26D2000-000FK7XR3-2532-26A5C-2126D2C022-003 BFY: 21 EFY: 22 Fund: C Budget Org: 26D2000 Program (PRC): 000FK7XR3 Budget (BOC): 2532 Cost: 26A5C DCN - Line ID: 2126D2C022-003 Funding Flag: Complete Funded: $71,000.00				220,119.72

PERFORMANCE WORK STATEMENT
TETRA TECH, INC.
Contract #EP-C-17-031
PR-ORD-21-01680
Task Order #: TBD
Amendment 1

Dated: September 14, 2021

I. Title: Development of technical resources for managing aquatic ecosystem stressors

II. EAS Short Title: Managing aquatic ecosystem stressors

III. Period of Performance: Date of Task Order award through 12 months following award

IV. Task Order COR:

Task Order COR (TOCOR)	**Alternate Task Order COR (ALTOCOR)**
Name: Caroline Ridley, PhD Office: EPA/ORD/CPHEA/HEEAD/IEABR 109 TW Alexander Drive (MC: B243-01) Research Triangle Park, NC 27709 Phone: 919-541-5341 Email: ridley.caroline@epa.gov	Name: Kate Schofield, PhD Office: EPA/ORD/CPHEA/HEEAD/IEABD 1200 Pennsylvania Avenue, NW (MC: 8623R) Washington, DC 20460 Phone: 202-546-2640 Email: schofield.kate@epa.gov

V. Introduction:

The EPA Office of Research and Development's (ORD) Integrated Environmental Assessment Branch-RTP and DC build the capacity of EPA program and regional offices and other decision-makers to assess and respond to potential effects on environmental quality. Research and assessment activities broadly support EPA's mission and responsibilities.

Assembling and interpreting data, information, and evidence related to the health of freshwater environments are challenging tasks. In applying data, information, and evidence to decision-making, the challenge may relate to short timelines of a decision; lack of methods for finding, accessing, and combining evidence in transparent ways; and understanding the current state of the science. Assessment scientists at EPA access, organize, synthesize, interpret, and communicate evidence from the published literature, and develop methodologies for others to do so, so that managers can more easily apply this source of information in their work.

EPA Office of Water (OW), state water quality managers, and local managers are the primary audiences for this effort. OW and state water quality managers work together to determine the cause(s) of water body impairment, develop numeric nutrient criteria that are protective of aquatic life in various types of water bodies (e.g., small streams, large rivers, lakes, etc.), implement other non-regulatory programs that help to limit the effects of stressors in aquatic ecosystems, and disseminate decision-relevant

information to support these efforts. Local managers often work to comply with these programs to ensure their waterbodies support healthy biological communities.

This Task Order (TO) has several areas. The first area involves selecting and reading documents to identify and summarize weight of evidence approaches used in developing numeric nutrient criteria. Weight of evidence is a process in which evidence is assembled, evaluated, and integrated to make a technical inference in an assessment. When used in the context of developing nutrient criteria, weight of evidence approaches can strengthen the basis for decision-making.

The second area involves support for meetings related to the current use of stressor identification (SI) in states, challenges states are facing using SI, and recommendations for future development of the SI framework that is currently laid out on the CADDIS website (www.epa.gov/caddis). It also involves technical support for the development or application of streamlined SI methods in states.

The third area involves (1) crafting visualizations for previously assembled evidence extracted from scientific papers and (2) organization and facilitation of one (1) webinar in 2022 which will present the results of a previous workshop series on rapid evidence assessment methods and applications.

The fourth area involves compiling a dataset and performing lake classification as foundations for a project on forecasting which lakes will exceed algal biomass thresholds related to harmful algal blooms. The project will test how well models based on open source, readily available datasets perform, while prioritizing smaller lakes that are not resolvable with satellite imagery. The models will be on a national scale, so classification of the lakes may be required and inform development of more than one model.

The fifth area involves developing a downloadable, desktop-based data explorer capable of illustrating changes in nutrient loadings to waterways over space and time, predictions of nutrient concentrations in waterways, and impacts of potential management actions. It also includes a workshop to identify additional agricultural best management practices that could be incorporated into the data explorer.

VI. Specific Tasks and Deliverables:

Task 1. Establish communication with the TOCOR, develop a QAPP (Contract Level PWS Section 3 and Section 5)

Specifically, the Contractor shall:

SubTask 1.1: Communication/Kick-off call

Within three (3) days of TO award, schedule a kick-off call to take place within 30 days with the TOCOR and appropriate contractor staff to discuss the TO, clarify any initial questions about tasks and deliverables, and confirm the schedule.

SubTask 1.2.A: Draft Quality Assurance Project Plan (QAPP):

Write a draft Quality Assurance Project Plan (QAPP) with the QA Track ID, L-HEEAD-0033234-QP-1-0. All tasks conducted under this TO shall be performed pursuant to an EPA approved QAPP developed by the Contractor and approved by the TOCOR and QA manager. The QAPP outlines the approach and measures the Contractor shall implement to ensure a high standard of quality in the deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5).

SubTask 1.2.B: Final Quality Assurance Project Plan (QAPP):

Write a final QAPP addressing TOCOR and QA Officer's written comments on the draft QAPP. The contractor shall not initiate tasks related to any items needing QA review until the TOCOR furnishes, in writing, a notice that the final QAPP for the current period has been accepted by EPA.

SubTask 1.3: Regular communication and financial reporting

Maintain regular communication with the TOCOR, produce monthly progress reports, and conduct financial reporting.

The draft QAPP shall be delivered as a Microsoft Word file and the final QAPP shall be delivered as a Microsoft Word file and Adobe Acrobat file.

Task	SubTask	Deliverable	Due
1	1.1	Kick-off call	Due within thirty-three (33) days after award
1	1.2.A	Draft QAPP	Due two (2) weeks after award
1	1.2.B	Final QAPP	Due one (1) week after receiving written comments on 1.2.A
1	1.3	Regular communication	Monthly

Task 2. Weight of Evidence. (Contract Level PWS Section 2 Task Area 3)

This task consists of reviewing published documents to extract examples of weight of evidence approaches used by states, tribes, or other groups to develop numeric nutrient criteria. It complements work conducted by the contractor in TO 68HERC21F0083 under Contract #EP-C-17-031 "Supporting water quality goals through literature and weight of evidence" to write detailed profiles of criteria development decision contexts for a limited number of states. Under this task, the contractor shall research additional state, tribal and academic weight of evidence approaches related to numeric nutrient criteria development. First, the contractor shall assemble a list of potential published documents to review. Second, the contractor shall review up to 10 of the identified documents with guidance from the TOCOR about what qualifies as a weight of evidence approach. The contractor shall provide short summaries of weight of evidence approaches (~1 paragraph per approach plus any visuals that the document uses to illustrate the approach) in the reviewed documents and group them into several categories and sub-categories including:

(1) Planning,
(2) Evidence assembly,
(3) Weighting evidence
    (a) Weighting evidence from primary data analyses (can include reference condition, stressor-response, mechanistic modeling analyses, among others)
    (b) Weighting evidence from literature-based evidence
    (c) Weighting evidence from meta-analyses, syntheses, and generalized system knowledge,
(4) Weighing the body of evidence
    (a) Evidence integration
    (b) Quantitative derivation
    (c) Explanation of discrepancies, ambiguities, and uncertainty.

It is anticipated that each reviewed document has 5-10 approaches to describe. The contractor shall not exceed 250 hours on this task.

Specifically, the Contractor shall:

SubTask 2.1: Call to brainstorm documents to review
Schedule and participate in a call with the TOCOR to discuss purpose of the Task, look at document examples known to the TOCOR, and begin brainstorming additional documents to review.

SubTask 2.2.A: Draft list of documents to review
Create a draft list of nutrient criteria-related documents that may describe weight of evidence approaches. Documents shall include published criteria documents and peer-reviewed articles and may include other document types, as appropriate. Draft list shall be recorded in a Microsoft Excel spreadsheet template provided by the TOCOR.

SubTask 2.2.B: Final list of documents to review
Create the final list of 10 nutrient criteria-related documents that are likely to describe weight of evidence approaches, based on conversations and written comments about the draft list from the TOCOR.

SubTask 2.3.A: Draft summaries of weight of evidence approaches
Write draft summaries of the weight of evidence approaches in the reviewed documents. For each approach identified, the contractor shall write ~1 paragraph and identify any visuals that the document uses to illustrate the approach. Approaches shall be grouped into categories and sub-categories as above. Writing shall be appropriate for inclusion in a peer-reviewed scientific publication.

SubTask 2.3.B: Final summaries of weight of evidence approaches
Revise the draft summaries to create the final summaries of the weight of evidence approaches in the reviewed documents based on written comments from the TOCOR.

The Contractor shall provide the deliverables for Task 2.2 as Microsoft Excel files and for Task 2.3 as Microsoft Word files.

Task	SubTask	Deliverable	Due
2	2.1	Call to brainstorm documents to review	Due within one (1) month of signing final QAPP
2	2.2.A	Draft list of documents to review	Due two (2) weeks after Deliverable 2.1
2	2.2.B	Final list of documents to review	Due one (1) week after receiving written comments from the TOCOR
2	2.3.A	Draft summaries of weight of evidence approaches	Due three (3) months after Deliverable 2.2.B
2	2.3.B	Final summaries of weight of evidence approaches	Due two (2) weeks after receiving written comments from the TOCOR

Task 3. Streamlined stressor identification (Contract Level PWS Section 2 Task Areas 1 and 7)

This task builds on work conducted by the contractor to summarize how individual states are applying the Stressor Identification (SI) process in TO 68HERC21F0083 under Contract #EP-C-17-031 "Supporting water quality goals through literature and weight of evidence." Under this task, the contractor shall provide support for a series of meetings related to the current use of SI in states,

challenges states are facing in the use of SI, and recommendations for future development of the SI framework that is currently laid out on the CADDIS website (www.epa.gov/caddis). The contractor also shall provide technical support for the development or application of streamlined SI processes for use in one or more specific states. The contractor shall not exceed 165 hours on this task.

Specifically, the Contractor shall:

SubTask 3.1: Initial planning call for Task 3

Schedule and participate in a call with the TOCOR to discuss the scope and purpose of the Task, potential approaches for the series of meetings, and potential assistance to specific states.

SubTask 3.2.A: Meetings summarizing state use of SI process

Provide logistical support for up to four (4) 1-hour meetings examining how states are using and adapting the SI process. Logistical support shall include setting up a registration process; providing a virtual platform for the meetings; drafting meeting announcements; troubleshooting any technical issues; facilitating the question-and-answer period during the meetings; and taking notes during the meetings.

SubTask 3.2.B: Post-meeting series summary

Following the last meeting, prepare a summary document that lists presenters and attendees for each meeting and provides notes about any discussions or questions during each meeting (summary of meeting presentations shall not be included).

SubTask 3.3: Technical support for streamlined SI applications

Provide technical support for one or more states that are developing or applying streamlined SI methods. The states selected and the specific technical support provided shall be determined via technical exchange with the TOCOR; the type of work may include (but not be limited to) data consolidation and standardization, data analysis, document review, and development of data visualizations and require advanced knowledge of SI and related analytical methods. The contractor shall not exceed 100 hours on this SubTask.

The Contractor shall provide the deliverables for SubTasks 3.2.B as a Microsoft Word file; deliverables for SubTask 3.3 shall be provided as Microsoft Word files, R code, Microsoft Excel spreadsheets, and .png files, based on the specific type of support provided.

Task	SubTask	Deliverable	Due
3	3.1	Initial planning call for Task 3	Due within one (1) month of signing final QAPP
3	3.2.A	Meetings summarizing state use of SI process	Due within six (6) months of Deliverable 3.1
3	3.2.B	Post-meeting series summary	Due within one (1) month of final meeting
3	3.3	Technical support for streamlined SI applications	Due within ten (10) months of Deliverable 3.1

Task 4. Rapid evidence assessment methods (Contract Level PWS Section 2 Task Areas 6 and 7).

This task consists of two (2) components focused on rapid evidence assessment methods: (1) the development of visualizations (e.g., interactive dashboards, figures, tables) summarizing literature-based evidence previously extracted from scientific papers including evidence datasets developed by the contractor in TOs 68HERC20F0434, 68HERC20F0094, and 68HERC20F0010 under Contract #EP-C-17-031, and (2) the organization and facilitation of one webinar (1-2 hours) in 2022 which shall present the results of a previous workshop series on rapid evidence assessment methods and applications. The visualizations developed under this task are for internal EPA use only; they will not be made publicly available at this time. The contractor shall not exceed 410 hours on this task.

Specifically, the Contractor shall:

SubTask 4.1: Initial planning call for Task 4

Schedule and participate in a call with the TOCOR to discuss the scope and purpose of the Task, existing datasets to be used for visualizations, selection of visualization software (Power BI, Tableau, or Qlik), and logistics for webinar planning.

SubTask 4.2.A: Draft visualizations for first dataset

Develop up to 15 draft visualizations for the first dataset provided by the TOCOR, using the visualization software which shall be selected in Sub-Task 4.1. The visualizations developed may include interactive heat maps and summary tables, geographic map-based graphics, histograms, bar charts, line graphs, forest plots, or box plots appropriate for categorical and continuous data. Visualizations shall only be for internal use under this subtask; they will not be made publicly available. Because visualizations shall be similar across this dataset and the second dataset (see Subtask 4.2C), standardized formats and templates shall be developed where possible to facilitate extension of methods.

SubTask 4.2.B: Revised visualizations for first dataset

Revise draft visualizations for the first dataset based on written comments received from the TOCOR.

SubTask 4.2.C: Draft visualizations for second dataset

Develop up to 15 draft visualizations for the second dataset provided by the TOCOR, using the visualization software selected in Sub-Task 4.1. The visualizations developed may include interactive heat maps and summary tables, geographic map-based graphics, histograms, bar charts, line graphs, forest plots, or box plots appropriate for categorical and continuous data. Formats and templates developed under SubTask 4.2.A shall be used to the extent possible. Visualizations shall only be for internal use under this subtask; they will not be made publicly available.

SubTask 4.2.D: Revised visualizations for second dataset

Revise draft visualizations for the second dataset based on written comments received from the TOCOR.

SubTask 4.2.E: Document summarizing adaptation of visualizations for other datasets

Draft a document (~5 pages of text, plus figures) that summarizes how the visualizations developed in Subtask 4.2A-D can be edited and adapted for other datasets identified in Subtask 4.1. This document shall include information on how data need to be structured in input files for the visualizations, how the existing visualizations can be edited, and how existing visualizations could be adapted for other datasets.

SubTask 4.3.A: Webinar preparation

Develop and host registration site for webinar; send out webinar announcement to distribution list supplied by the TOCOR; run practice session for presenters on webinar platform.

SubTask 4.3.B: Webinar hosting and facilitation
Host webinar and facilitate question-answer period.

SubTask 4.3.C: Post-webinar summary
Prepare post-webinar summary document that lists presenters and attendees and provides brief notes about any discussions or questions during the webinar (summary of webinar presentations shall not be included).

The Contractor shall provide the deliverables for SubTask 4.2.A-D as pdf and PowerPoint export versions of visualizations, in addition to URL links to the fully interactive visualizations. SubTasks 4.2.E and 4.3.C shall be provided as Microsoft Word files.

Task	SubTask	Deliverable	Due
4	4.1	Initial planning call for Task 4	Due within one (1) month of signing final QAPP
4	4.2.A	Draft visualizations for first dataset	Due within one (1) month of receiving dataset from TOCOR
4	4.2.B	Revised visualizations for first dataset	Due within one (1) month of receiving comments from TOCOR
4	4.2.C	Draft visualizations for second dataset	Due within one (1) month of receiving dataset from TOCOR
4	4.2.D	Revised visualizations for second dataset	Due within one (1) month of receiving comments from TOCOR
4	4.2.E	Document summarizing adaptation of visualizations for additional datasets	Due within one (1) month of Deliverable 4.2.D
4	4.3.A	Webinar preparation	Due two (2) months before date of webinar
4	4.3.B	Webinar hosting and facilitation	Due on date of webinar
4	4.3.C	Post-webinar summary	Due within one (1) month following webinar

Task 5. Harmful algal blooms (HABs) forecast dataset and lake classification (Contract Level PWS Section 2 Task Areas 2 and 4)

The goal of this task is to develop a dataset and perform lake classification that shall provide a foundation for a project on forecasting algal blooms using open source, readily available datasets while prioritizing smaller lakes that are not resolvable with satellite imagery. The 2021 World Health Organization guidelines included alert level thresholds for recreational water use at 8mm^3/L cyanobacterial biovolume or 24 µg/L chlorophyll a with cyanobacteria dominant. To build and test models of chlorophyll a or cyanobacterial biovolume to forecast which lakes will exceed the WHO thresholds, data compilation is needed (first subtask). For the second subtask, the lakes included in the compiled data shall be subset into groups according to the results of a classification procedure. The third

subtask is a report summarizing methods and lake classification results. The contractor shall not exceed 240 hours on this task.

Specifically, the Contractor shall:

SubTask 5.1.A: Draft open source data compilation

Compile data capable of being input in SubTask 5.2 lake classification. Compilation shall consist of open source datasets used in **Ho and Michalak 2020** and datasets available from **Ross et al. 2019 (AquaSat)**, **Hill et al. 2016 (StreamCat)**, and **Sabo et al. 2021** (nitrogen and phosphorus inventories). Copies of the four (4) references are to be provided by the TOCOR. Data compilation shall be limited to the lakes sampled in NLA 2007, 2012, and 2017. Watershed-scale datasets (i.e., nutrient inventories) shall be geospatially summarized and matched with lake-specific data. The contractor shall utilize any dataset referred to here has already been compiled by the contractor during TO 68HERC20F0434 under Contract #EP-C-17-031 for this SubTask.

Ho, J.C. and Michalak, A.M., 2020. Exploring temperature and precipitation impacts on harmful algal blooms across continental US lakes. Limnology and Oceanography, 65(5), pp.992-1009.

The open source datasets used by Ho and Michalak 2020 include: National Lakes Assessment (NLA) 2007, NLA 2012, NLA 2017 data (specifically, chlorophyll a concentration, cyanobacterial biovolume, microcystin concentration, total nitrogen concentration, total phosphorus concentration, water temperature profiles, maximum depth, and sample date); National Hydrography Dataset (specifically, latitude, longitude, surface area, lake depth, and up to two (2) additional fields to be determined by the TOCOR ; Daymet Version 3 (specifically, daily precipitation data); Palmer Drought Severity Index data; and the North American Land Data Assimilation phase 2 (NLDAS2) (specifically, hourly air temperature over lake's surface).

Ross, M.R., Topp, S.N., Appling, A.P., Yang, X., Kuhn, C., Butman, D., Simard, M. and Pavelsky, T.M., 2019. AquaSat: A data set to enable remote sensing of water quality for inland waters. Water Resources Research, 55(11), pp.10012-10025.

AquaSat is available for download at: https://figshare.com/articles/dataset/AquaSat/8139383.

Hill, Ryan A., Marc H. Weber, Scott G. Leibowitz, Anthony R. Olsen, and Darren J. Thornbrugh, 2016. The Stream-Catchment (StreamCat) Dataset: A Database of Watershed Metrics for the Conterminous United States. Journal of the American Water Resources Association (JAWRA) 52:120-128. DOI: 10.1111/1752-1688.12372

StreamCat is available at: https://www.epa.gov/national-aquatic-resource-surveys/streamcat-dataset-0. Up to twenty (20) variables are to be selected by the TOCOR.

Sabo, R.D., Clark, C.M. and Compton, J.E., 2021. Considerations when using nutrient inventories to prioritize water quality improvement efforts across the US. Environmental Research Communications, 3(4), p.045005.

Datasets from Sabo et al. 2021 are to be provided by the TOCOR. If updated versions of the Sabo et al. datasets become available, the 2021 datasets will be replaced by the updated datasets and provided by the TOCOR.

SubTask 5.1.B: Final open source data compilation

Create a final compilation of datasets, based on draft compilation in SubTask 5.1.A and written comments from the TOCOR.

SubTask 5.2.A: Draft lake classification

Conduct classification of lakes using the compiled dataset from SubTask 5.1.B and the methods for divisive tree algorithm described in Yuan and Pollard 2015. A copy of this reference is to be provided by the TOCOR. A proposal specifying up to thirty (30) important predictors to include in lake classification shall be provided to the TOCOR before conducting the algorithm.

Yuan, L.L. and Pollard, A.I., 2015. Deriving nutrient targets to prevent excessive cyanobacterial densities in US lakes and reservoirs. Freshwater Biology, 60(9), pp.1901-1916.

SubTask 5.2.B: Final lake classification

Create a final lakes classification, based on draft classification in SubTask 5.2.B and written comments from the TOCOR.

SubTask 5.3.A: Draft Report

Write a draft report about the datasets, methods for dataset processing, methods for lake classification, and results of SubTasks 5.1 and 5.2. The draft report shall be approximately 20 pages. The methods for data processing shall document how the datasets were combined, manipulated, which parts of datasets were removed, and any other transformations to the data deemed necessary for creating a compiled dataset that could be applied to modeling efforts. The methods for lake classification shall include any deviations from those in Yuan and Pollard 2015. The results shall include summary tables for the minimum, mean, median, maximum of the variables in the compiled datasets and up to five (5) figures to aid visualization of lake classification outputs.

SubTask 5.3.B: Final Report

After obtaining feedback from the TOCOR, revise the deliverable from SubTask 5.3.A by addressing TOCOR's written comments. With the final report, the Contractor shall include R code and other supporting materials developed while performing Task 5 that would aid replication of data processing and lake classification methods.

Contractor shall provide the deliverables for 5.1 and 5.2 as Excel and csv files. Contractor shall provide the deliverables for 5.3 as Word, R code, and .TIF files.

Task	SubTask	Deliverable	Due
5	5.1.A	Draft compiled dataset	Within three (3) months of signing final QAPP
5	5.1.B	Final compiled dataset	Within one (1) month of receiving written comments from the TOCOR
5	5.2.A	Draft lake classification results	Within one (1) month of completing Subtask 5.1.B
5	5.2.B	Final lake classification results	Within two (2) weeks of receiving written comments from the TOCOR
5	5.3.A	Draft report	Within one (1) month of completing SubTask 5.2.B
5	5.3.B	Final report	Within one (1) month of receiving written comments from the TOCOR

Task 6. Nutrient Inventory Tool (Contract Level PWS Section 2 Task Area 5 and 7)

This task is focused on developing a downloadable, desktop-based data explorer based in the software R Shiny capable of illustrating 1) spatiotemporal shifts in recently developed nitrogen and phosphorus inventories as well as some additional ancillary environmental variables (both mapping features and graphics), 2) predictions of nutrient concentrations and loads from EPA provided empirical/statistical models, and 3) application of various scenario functions where the user can adjust input variables of aforementioned models to explore watershed responsiveness to management action and environmental variability. Preliminarily titled the "Nutrient Inventory Tool", specific capabilities of the tool are to be outlined in a concept proposal developed by the contractor in summer of FY21 (as defined in TO 68HERC20F0434 under Contract #EP-C-17-031). The contractor shall not exceed 520 hours on this Task.

Specifically, the Contractor shall:

SubTask 6.1.A: Data Curation/Correction Report and Procedural Outline

Curate existing datasets and models that the contractors have developed in previous work in FY2020-FY2021 in TO 68HERC20F0434 under Contract #EP-C-17-031. The contractor shall provide a report not to exceed 5 pages on any data issues (e.g., reformatting needs, odd values) and a procedural outline on how each dataset and model shall be incorporated into the Nutrient Inventory Tool as described in the concept proposal developed by the contractors in FY21 in TO 68HERC20F0434 under Contract #EP-C-17-031. Upon TOCOR approval of the data curation/correction report and procedural outline (e.g., a flow-board of the tool based on the concept proposal developed by contractors in FY21), contractor shall address any data issues and provide documentation of the corrections (if needed) then proceed with Subtask 6.1B.

SubTask 6.1.B: Nutrient Inventory Tool

Develop a downloadable, desktop-based data explorer based in the software R Shiny (or similar application with equivalent functionality) capable of illustrating 1) spatiotemporal shifts in recently developed nitrogen and phosphorus inventories as well as ancillary environmental variables (both mapping features and graphics), 2) predictions of nutrient concentrations and loads from EPA provided empirical/statistical models, and 3) application of various scenario functions where the user can adjust input variables of aforementioned models to explore

watershed responsiveness to management action and environmental variability. Contractor shall provide proof of functionality to TOCOR and potential user groups. More detailed capabilities of the data explorer are to be identified in a concept proposal currently being developed by the contractors in FY21 in TO 68HERC20F0434 under Contract #EP-C-17-031. For this SubTask, the contractor shall deliver the data explorer, relevant code, QA/QC documentation, metadata, notes on methodologies suitable for inclusion in a peer-review scientific publication, and guidance document for the general public appropriate for release as a data publication. Code shall be in a format capable of posting to GitHub and EPA's ScienceHub. This SubTask shall not exceed 400 hours.

SubTask 6.2: BMP Workshop and Report

Coordinate a small, targeted hybrid or online workshop (~50 participants) focused on describing available agricultural best management practice (BMP) datasets across the contiguous United States and identifying solutions for incorporating them into the Nutrient Inventory Tool. This workshop shall be no more than 8 hours and take place over one (1) or two (2) days. The TOCOR is to identify attendees including federal research scientists and other relevant participants. Any in-person activities shall leverage existing federal conference space. Contractor shall develop and maintain the invitee list, facilitate the workshop with notetakers and technical online assistance, and provide a ~10 page report describing major datasets and highlighted solutions for incorporating them into the Nutrient Inventory Tool or making them more publicly available in general.

Contractor shall provide the deliverables for SubTask 6.1.A, SubTask 6.1.B and Sub-Task 6.2 as Microsoft Word files and for SubTask 6.1.B as an R-based (or similar) tool compatible with the most recent version of software available at the time of the deliverable submission.

Task	SubTask	Deliverable	Due
6	6.1.A	Data Curation/Correction Report and Procedural Outline	Due within two (2) months of signing final QAPP
6	6.1.B	Nutrient Inventory Tool	Due within three (3) months of approval of Subtask 6.1.A
6	6.2	BMP Workshop and Report	Due within six (6) months of approval of Subtask 6.1.B

VII. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures/visualizations submitted as PNG and TIFF files shall be of high quality, similar to those in presentations developed for national scientific meetings and shall be compatible with Microsoft Photos Version 2020.20090.1002.0. Microsoft Excel, Microsoft PowerPoint, Microsoft Word, and CSV files deliverables shall be compatible with Microsoft Office 365 Version 16.0.13127.21452. PDFs shall be compatible with Adobe Acrobat Version 2020.009.20074. R code shall be compatible with the most recent version of R available at the time of deliverable submission.

SUMMARY SCHEDULE OF DELIVERABLES			
Task	**SubTask**	**Deliverable**	**Due**
1	1.1	Kick-off call	Due within thirty-three (33) days after award
1	1.2.A	Draft QAPP	Due two (2) weeks after award
1	1.2.B	Final QAPP	Due one (1) week after receiving written comments on 1.2.A
1	1.3	Regular communication	Monthly
2	2.1	Call to brainstorm documents to review	Due within one (1) month of signing final QAPP
2	2.2.A	Draft list of documents to review	Due two (2) weeks after Deliverable 2.1
2	2.2.B	Final list of documents to review	Due one (1) week after receiving written comments from the TOCOR
2	2.3.A	Draft summaries of weight of evidence approaches	Due three (3) months after Deliverable 2.2.B
2	2.3.B	Final summaries of weight of evidence approaches	Due two (2) weeks after receiving written comments from the TOCOR
3	3.1	Initial planning call for Task 3	Due within one (1) month of signing final QAPP
3	3.2.A	Meetings summarizing state use of SI process	Due within six (6) months of Deliverable 3.1
3	3.2.B	Post-meeting series summary	Due within one (1) month of final meeting
3	3.3	Technical support for streamlined SI applications	Due within ten (10) months of Deliverable 3.1
4	4.1	Initial planning call for Task 4	Due within one (1) month of signing final QAPP
4	4.2.A	Draft visualizations for first dataset	Due within one (1) month of receiving dataset from TOCOR
4	4.2.B	Revised visualizations for first dataset	Due within one (1) month of receiving comments from TOCOR
4	4.2.C	Draft visualizations for second dataset	Due within one (1) month of receiving dataset from TOCOR
4	4.2.D	Revised visualizations for second dataset	Due within one (1) month of receiving comments from TOCOR
4	4.2.E	Document summarizing adaptation of visualizations for additional datasets	Due within one (1) month of Deliverable 4.2.D
4	4.3.A	Webinar preparation	Due two (2) months before date of webinar

SUMMARY SCHEDULE OF DELIVERABLES			
Task	**SubTask**	**Deliverable**	**Due**
4	4.3.B	Webinar hosting and facilitation	Due on date of webinar
4	4.3.C	Post-webinar summary	Due within one (1) month following webinar
5	5.1.A	Draft compiled dataset	Within three (3) months of signing final QAPP
5	5.1.B	Final compiled dataset	Within one (1) month of receiving written comments from the TOCOR
5	5.2.A	Draft lake classification results	Within one (1) month of completing Subtask 5.1.B
5	5.2.B	Final lake classification results	Within two (2) weeks of receiving written comments from the TOCOR
5	5.3.A	Draft report	Within one (1) month of completing SubTask 5.2.B
5	5.3.B	Final report	Within one (1) month of receiving written comments from the TOCOR
6	6.1.A	Data Curation/Correction Report and Procedural Outline	Due within two (2) months of signing final QAPP
6	6.1.B	Nutrient Inventory Tool	Due within three (3) months of approval of Subtask 6.1.A
6	6.2	BMP Workshop and Report	Due within six (6) months of approval of Subtask 6.1.B